

One new *Banksia* and two new *Grevillea* species (Proteaceae: Grevilleoideae) from Western Australia

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Abstract

Olde, Peter M. and Marriott, Neil R. One new *Banksia* and two new *Grevillea* species (Proteaceae: Grevilleoideae) from Western Australia. *Nuytsia* 15(1): 85–99 (2002). *Banksia rosserae* P. Olde & N. Marriott, a new species of *Banksia* R. Br., *Grevillea kirkalocka* P. Olde & N. Marriott and *G. squiresae* P. Olde & N. Marriott, two new species of *Grevillea* R. Br. (Proteaceae: Grevilleoideae) are described. Their affinities are discussed and keys are provided. All of the new species have conservation priority.

Introduction

Three newly discovered species in the Western Australian Proteaceae are described here. The discovery of *Grevillea squiresae*, in the South West Botanical Province is not surprising, given the biodiversity of south-west Western Australia and the rising base of knowledge about its flora in particular. That two new members of the Proteaceae, *Banksia rosserae* and *Grevillea kirkalocka*, should be discovered in the same place in the Eremaean Province of the vast arid zone highlights our still restricted knowledge about the Australian flora, which has been largely built from collections on public roadsides. These two discoveries in the Mount Magnet area result from plant surveys on private and reserve land, an increasingly important resource in the emergence of new species. The existence of areas of deep yellow sand heath in this region is not widely known and these areas have only recently been sampled botanically. *Banksia rosserae* is geographically isolated from the remainder of its genus and is the only species that occurs exclusively in a desert region.

All of the new taxa and their closest relatives have been seen in the field. Conservation codes are those used by the Western Australian Department of Conservation and Land Management. In all descriptions we have preferred the term confluence to inflorescence, following Johnson & Briggs (1975) and Briggs & Johnson (1979).

Taxonomy

Placement of new species in *Banksia* R.Br.

Depending on which authority is followed, the number of accepted *Banksia* species prior to the circumscription of *Banksia rosserae* ranged between 76 (George 1999) and 80 (Thiele & Ladiges 1996). Recognition of *B. cunninghamii* Sieber ex Reichb. at specific rank is maintained at NSW though not by either George or Thiele & Ladiges (Harden 2002).

Banksia rosserae is here treated provisionally as a member of subgenus *Banksia*, section *Banksia*, series *Cyrtostylis* (Benth.) A.S. George. The inclusion of *B. rosserae* means that there are now 14 species in this series. Series *Cyrtostylis* was erected as a series and more closely defined by A.S. George in 1981. It differs from Bentham's concept of it as a section where, through a process of delimitation by elimination, it acts "as a repository for a disparate collection of otherwise unplaced species" (Thiele & Ladiges 1996: 662). Only three species placed in the section by Bentham were retained by George, the others being referred to three other series.

Important characters defining series *Cyrtostylis* given by George (George 1981 & 1999) are: *cotyledons* obovate to rounded-cuneate, often crenulate, sometimes emarginate; *shrub* or *tree* habit, lignotuberous or not; *leaves* alternate, serrate or triangular-lobed with flat or slightly recurved margins; *conflouescence* terminal or on short lateral branchlets, cylindrical, ovoid or spherical, erect or in one (now two) species pendulous, the buds typically losing regular pattern before anthesis; *perianth* glabrous to villous, quite straight or sometimes with the limb somewhat upturned before anthesis, relaxed after anthesis, yellow, ferruginous, orange or reddish; tepals not awned; *pistil* straight or gently curved; pollen-presenter usually less than 3 mm long, slightly thickened, finely costate or smooth; *pollen* crescent-shaped; *follicles* elliptic mostly less than 2 cm long, laterally beaked after opening, split from styler point; *seed wing* notched.

Many of these defining character states are also common to other series, especially series *Tetragonae* A.S. George, and *B. rosserae* also shares many diagnostic features including glabrous perianths and pendent conflouescences common to species in this series. It also keys out to this series in his key to infrageneric taxa (George 1999: 177).

George (1981: 345 & 1999: 214) has referred to his series *Cyrtostylis* as being 'rather heterogeneous'. After undertaking a phylogenetic analysis of *Banksia* based on 104 morphological and anatomical characters using cladistic parsimony methods, Thiele & Ladiges found no apparent synapomorphies for series *Cyrtostylis* and have referred to it as 'widely polyphyletic' (Thiele & Ladiges 1996: 715). They have proposed a classification in which not all taxa are placed in a higher-level taxon. The basis for this is that it more accurately reflects current knowledge and that taxa placed uncertainly now are most likely to be moved anyway within the cladogram after new data are analysed. These taxa are left *incertae sedis*.

The 'clearly non-monophyletic' series *Cyrtostylis sensu* A.S. George has been virtually dismantled by Thiele & Ladiges, splitting it into three narrowly defined series and leaving four species *incertae sedis*. *Banksia elegans*, a possible sister taxon to subgenus *Isostylis*, has been removed from subgenus *Banksia* altogether, thus rendering both taxa monophyletic. *Banksia elderiana* has also been removed from series *Cyrtostylis* and placed with other species that have pendent conflouescences and straight styles in a redefined series *Tetragonae*. The original concept of series *Cyrtostylis* has been redefined to a monophyletic grouping of only four species. Two additional series have been erected, a

monospecific series *Lindleyana* K. Thiele and series *Ochraceae* K. Thiele with three species, one of which is *B. laevigata*. *Banksia attenuata*, *B. ashbyi*, and *B. lullfitzii* remain *incertae sedis* within subgenus *Banksia*.

The analysis has “produced a generally poor match with existing taxonomy” (Thiele & Ladiges 1996: 661) and with so many unresolved taxa must be regarded as a first-step analysis only. George (1999: 176) has also disagreed with many of their placements, including the transfer of *B. elderiana* into series *Tetragonae*, preferring a broader grouping that has been provisionally followed here, “until further data tell us otherwise”.

Plant material from which the diagnosis of *B. rosserae* was made was collected at the post-anthesis stage and this has prevented us from making observations on some defining character states including floral development, flower colour, arrangement of perianth limbs at anthesis, orientation and flexing of the perianth limb before and during anthesis, exertion characteristics of the style before anthesis, pollen characters.. We have perceived a close relationship between *Banksia laevigata* and *B. rosserae* which a more informed study may find superficial. Until more data are collected on some of the character states employed by A.S. George and Thiele & Ladiges, *B. rosserae* cannot be placed with certainty in either scheme.

The *Banksia* description closely follows the format and terminology used by George (1981) except that Thiele & Ladiges (1996) have provided the model for description of the style end. An attempt has also been made to describe, where possible, other character states introduced in their study.

Amendments to *Banksia* keys

The key to infrageneric taxa of *Banksia* in “Flora of Australia” Volume 17B (George 1999: 177) breaks down at lead 9 and is here amended only in the most basic manner because important characters such as exertion of the style before anthesis, timing of tepal relaxation after anthesis, pollen shape and bud arrangement remain to be observed from fresher material.

- 9 Conflorescence pendulous; perianth limb glabrous, tetragonous, with tepal limbs prominently keeled; pistil not laterally exerted between tepals before anthesis; tepals separating around pollen-presenter but not immediately relaxing at anthesis; pollen-presenter 4–8 mm long, muricate ser. 7. **Tetragonae**
- 9: Conflorescence erect (pendulous in *B. elderiana* and *B. rosserae*); perianth limb either hairy or if glabrous then not tetragonous, the tepal limbs not prominently keeled; pistil usually laterally exerted between tepals before anthesis; tepals usually relaxed after anthesis; pollen-presenter commonly less than 3 mm long, rarely to 5 mm, smooth

The key to species of *Banksia* in “Flora of Australia” Volume 17B (George 1999: 178–184) is modified by insertion of the couplet at 41a on page 180.

- 40 Perianth glabrous
 - 41 Conflorescences pendulous
 - 41a Conflorescences spherical or narrow-ellipsoid with axis 3–3.5 cm long; perianth limb not tetragonous; style hairy in the basal 3–4 mm; follicle 10–22 mm long **B. rosserae**

41a: Conflorescences cylindrical, barrel-shaped, ovoid with axis 5–11 cm long;
perianth limb tetragonous; style glabrous; follicle 30–45 mm long

42 Leaf lobes ± obtuse, 1–3 mm long **B. lemanniana**

Banksia rosserae P. Olde & N. Marriott, *sp. nov.*

A *Banksia laevigata* Meissner habitu lignotuberoso, cortice praecipue prope basem fruticis papyracea, conflorescentiis minoribus et nutantibus, perianthio glabro, bracteis non aristatis, stylo sparsim tomentoso basem versus, fructibus minoribus, folliculis maioribus et conspicuioribus differt.

Typus: near Mount Magnet [exact location withheld for conservation reasons], Western Australia, 4 September 2001, K. Alcock 902 (*holo*: PERTH; *iso*: MEL, NSW).

Differs from *Banksia laevigata* Meissner in its lignotuberous habit, in its papery bark (especially near the base of the shrub), in its smaller, nodding conflorescences, its bracts not awned, its perianth glabrous, the style sparsely tomentose near the base and in its smaller infructescences with larger and more conspicuous follicles.

Cotyledons spreading, obovate-cuneate, with upper margin oblique and crenulate, flat to concave, 9–14 mm long, 5–14 mm wide, medium green with a red margin, reticulate; upper surface flat to concave, prominently reticulate; margin oblique and the apex slightly crenulate: auricles horizontal to slightly descending, acute, 1.5–2 mm long. *Hypocotyl* 5–9 mm long, 2 mm thick, slightly pilose, reddish. *Seedling* leaves crowded, first 2–4 pairs opposite, obovate-cuneate; first pair 11–19 mm long, 5–8 mm wide, margins ± flat, apically to sub-apically lobed with 4–6 acute lobes, subsequent pairs 1.5–4 cm long, 10–16 mm wide, margins slightly recurved, dentate with 4–7 acute-triangular lobes 2–4 mm long; upper surface reticulate, pilose; lower surface pilose on midrib, the lamina cobwebby. *Seedling stem* not observable. *Mature plant* a multi-stemmed, open-branched shrub 2.5–3 m high, 3–4 m wide, with lignotuber up to 1 m across. *Trunks* 10–15 cm wide, epicormic buds visible on some. *Bark* papery, flaky-rough, grey with reddish new bark beneath. *Branchlets* grey, terete, occasionally fissured, tomentose-hirsute, the indumentum sparse to dense, mostly consisting of short, tightly curled trichomes and occasional longer straight to wavy trichomes, the latter more numerous around leaf nodes; prophylls occasional, narrowly linear-subulate, 5–6 mm long, tomentose-hirsute; short side branches frequent; internodes irregular, sometimes very short, occasionally 5 or 6 leaves clustered in a whorl around a single, mostly slightly expanded node. *Leaves* alternate, narrowly linear to obovate or narrow-elliptical, 5–12 cm long, 5–12(14) mm wide, scarcely discolorous; base cuneate; apex mostly acute, sometimes obtuse, mucronate; mucro rigid, non-pungent, 0.4–0.8 mm long; margins flat, serrulate to denticulate, sometimes the teeth concentrated in the upper 2/3, the sinuses 9–12(30) mm long shallow, broadly u-shaped, mostly irregular in length on the same leaf, the teeth 1–1.2 mm long, triangular, mostly terminated by a rigid, slightly pungent, ascending mucro 0.2–0.8 mm long, sometimes the mucro obscure, blunt; upper surface tomentose when juvenile, soon glabrous, smooth to slightly punctate, somewhat shiny; lower surface glabrous except for numerous white-woolly stomatal pits in lateral to ascending rows; venation consisting of a yellowish and prominently raised midvein on both surfaces, lateral venation obscure above, evident to obscure below; petiole 3–5 mm long narrow but broadening at the point of attachment; texture coriaceous. *Conflorescence* terminal on short or extended, leafy side-branches, sessile to shortly pedunculate, simple, spherical to slightly ovoid or compressed-ellipsoid, 4–5.5 cm long, 4–4.5 cm wide, or if including styles at anthesis 6–7 cm wide, dense, pendent on decurved branchlets or peduncle; conflorescence development to be determined; peduncle 1.2–2 cm long, strongly decurved or deflexed at or near the conflorescence base; axis 3–3.5 cm long, 5 mm wide at

widest point, narrowly elliptic in longitudinal section. *Involucral bracts* 3–5 mm long 1.2–1.5 mm wide, grey-tomentose, the proximal bracts linear, persistent, the distal bracts ovate, caducous. *Common bracts* narrowly obovoid-cuneate, 5.5–7 mm long, 1.2–2 mm wide, appressed-ferrugineo-hirsute with long straight hairs, the apex convex, glabrous. *Floral bracts* similar, linear to narrowly obovate, 3.5–5 mm long. *Flowers* borne over the whole distal surface of the axis, colour not seen *in vivo*, possibly yellow (A. Pilkington pers. comm.), light brown *in sicco*. *Perianth* 30–32 mm long including limb 4–5 mm long, glabrous; claws filiform, not awned, 1.8 mm wide; tepals relaxed and twisting strongly in the upper half after anthesis, adherent 3–4 mm above the base, the margins noticeably darker than the creamy central rib; limb narrowly ellipsoid, the segments not keeled, orientation before anthesis to be determined. *Anthers* linear, 2–2.8 mm long, 0.3 mm wide, with acute apex, the filament 0.2 mm long. *Hypogynous scales* oblong to linear, 1.8 mm long, translucent. *Pistil* 30–33 mm long; ovary villous at the apex, the hairs *c.* 0.6 mm long; style slender, straight over most of its length, slightly curved and narrowed below the pollen-presenter, sparsely tomentose-pubescent in the basal 3–4 mm, otherwise glabrous, exertion or not before anthesis not observed; style-end 2 mm long, scarcely wider than the style; shoulder transverse, neck quadrangular, *c.* 1 mm long; collar dilated slightly; pollen-presenter 1.25 mm long, 0.25 mm wide, linear, slightly compressed, smooth, finely costate, the apex obtuse; stigmatic groove subterminal, very oblique to lateral; *pollen* not seen. *Infructescence* spherical, 4.5–5 cm diam., old perianths and styles persistent, the apex of the styles sometimes recurved. *Follicles* (9)12–20(25), 10–22 mm long, 7–10 mm high, 5–13 mm wide, in plan view broadly elliptic, a few open without fire, most apparently opening after fire to *c.* 15 mm across; valves in side-view obliquely semi-elliptic, slightly enlarged on the stylar side with a broad lateral peak, opening from the stylar point exposing a short \pm lateral beak, notched on the underside at the stylar insertion point; stylar peg absent; outer surface densely grey-tomentose, smooth, broadly convex with a slightly raised, narrow central ridge below the suture; ridge obtuse, partially glabrous; suture fine; lips 0.5 mm wide, even. *Seed* 18–21 mm long, obovate-triangular, discolourous; seed body 7–10 mm long, 7–9 mm wide, obovate-cuneate with the base acute, the upper margin straight to slightly oblique, thickened on the outer face, ridged on the inner face, lateral margins straight and faintly to obviously flanged; inner surface convex, glistening black, rugose and with faint to evident semi-concentric wrinkling; outer surface convex, smooth to rugose with faint longitudinal wrinkles, grey-black; seed wing 9–12 mm wide, uniformly grey-black, darkly translucent, rugose, elliptic with an excurrent curve to the stylar side and drawn to a lateral point, notched below the apex on the underside forming a secondary obtuse lobe \pm erect from the upper margin of the seed body. *Separator* 18 mm long, 12 mm wide, \pm obovate-cuneate; apex slightly oblique and drawn to a lateral point, subreniform; valves thin, impressed by the seed body and wing, thicker near the apex, recurved in the apical quarter, ridged along the ventral axis, the base apiculate. (Figure 1)

Other specimen examined. WESTERN AUSTRALIA: near Mount Magnet [exact location withheld], 4 Sep. 2001, P. Olde & N. Marriott 01/114 (NSW, PERTH).

Distribution. Western Australia; known only from an area south-south-east of Mount Magnet in the Murchison Region of the Austin District in the Ereman Province. There are apparently several populations in the district (A. Pilkington pers. comm.). Specimens of *Banksia* have not previously been collected in the Murchison Region although the distribution of *B. elderiana* extends to Victoria Spring in the adjacent Great Victoria Desert Region. The distribution of *Banksia rosserae* represents both a significant extension of range into the arid zone and a significant geographic disjunction for the genus.

Habitat and ecology. Dominant with mallee eucalypts in deep yellow sand and laterite with open heath flora including *Grevillea kirkalocka*, *G. acacioides*, *G. juncifolia* subsp. *juncifolia*, *G. biformis* subsp. *biformis*, *G. apiculoba* subsp. *apiculoba*, *Hakea invaginata*, *Leptospermum* sp., *Melaleuca* sp.,

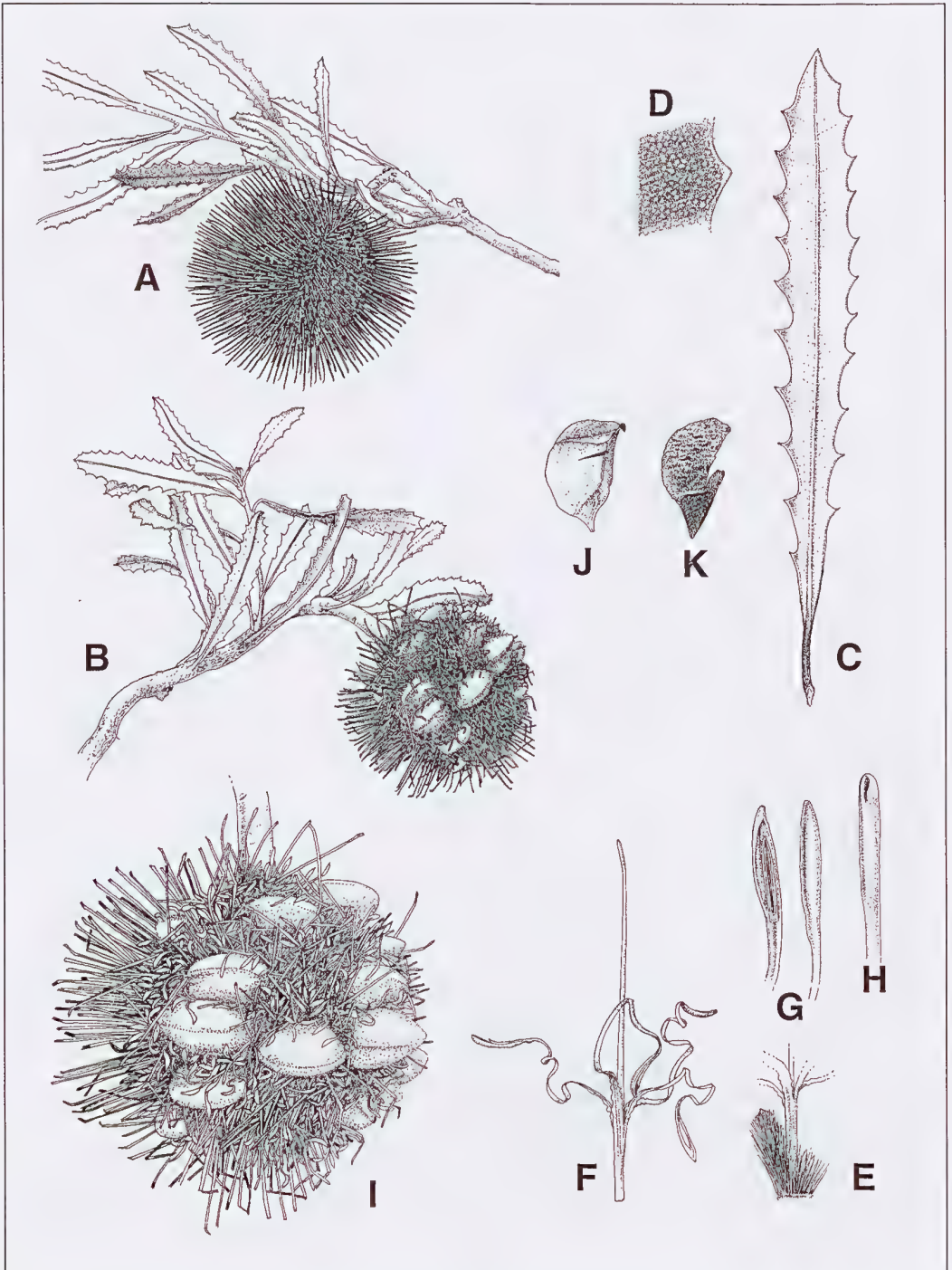


Figure 1. *Banksia rosserae*. A – flowering branch (x0.5), B – fruiting branch (x0.5), C – leaf (x1), D – portion of undersurface of leaf (x5), E – floral bract and base of perianth (x2), F – perianth (x2), G – inner and outer views of perianth limb (x5), H – style end (x10), I – infructescence (x1), J – separator (x1), K – seed (x1).

Cryptandra sp., *Triodia basedowii*. Although the distribution is in the arid zone, the flora associated with the new *Banksia* has more in common with sandplain flora of the South West Botanical Province.

Flowering period. Uncertain; probably late winter to early spring.

Fruiting period. Late spring onwards.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. The species is known from a single small population of 20 individuals on private land. The precise location is withheld for conservation purposes. Although systematic surveys of the adjoining reserve may well reveal further populations, the species appears to be of high priority for conservation.

Etymology. Named in honour of Celia Elizabeth Rosser (nee Prince) M Sc., OAM (1930–) of Box Hill Victoria, acclaimed botanical artist who, while employed as Science Faculty Artist at Monash University, Melbourne painted every species of *Banksia* for “The Banksias” a three-part monograph which confirmed her standing as one of the world’s greatest botanical illustrators.

Affinities. The diagnostic features distinguishing *B. rosserae* are lignotuberous (and epicormic) habit, pappy bark around the base of stems, shortly dentate, relatively small obovate- to linear-cuneate leaves, nodding, round to slightly ovoid, dense and relatively small conflorescences and infructescences, glabrous perianth, slender style sparsely hairy in the basal quarter and apparently (from dried specimens) slightly curved near the apex, follicles with a small lateral beak visible after opening.

Through a combination of leaves that are almost indistinguishable from narrow-leaved forms of *Banksia laevigata* in their shape, size and dentition, \pm round, condensed conflorescences, and slender-styled flowers, *B. rosserae* seems most closely related to *B. laevigata*. However, *B. laevigata* has a non-lignotuberous habit, a hairy perianth and awned common bracts. *B. rosserae* shares with *B. lullfitzii* a lignotuberous habit, similar bracts and stylar indumentum. It is one of only two species in the series (*sensu* George) with pendent conflorescences and one of three with spherical conflorescences.

Banksia rosserae keys out with and also has affinities with species in series *Tetragonae* *sensu* George (1981), notably through its glabrous perianth and pendent conflorescences. However it lacks the diagnostic tetragonous perianth limb (the tepal limbs are not keeled) and the plants are lignotuberous. It further lacks the muricate pollen-presenter, regarded by Thiele & Ladiges as a synapomorphy of the series, and the perianth is both shorter than the pistil and relaxed after anthesis. A more detailed analysis beyond the scope of this paper is required to clarify the relationship between species within series *Tetragonae* and series *Cyrtostylis*.

Placement of new species in *Grevillea* R.Br.

Both *Grevillea kirkalocka*, which appears to be most closely related to *Grevillea nana* C.A. Gardner, and *G. squiresae*, which appears to be most closely related to *G. aneura* McGill., are members of Group 35 *sensu* Olde & Marriott (1994b), a large group of mainly toothbrush grevilleas that occurs over most botanical districts of Australia. Coincidentally, both new species are also closely related to each other. The two new species belong in Subgroup *Asplenifolia/Hookeriana* of the *Pteridifolia* Group *sensu* Makinson (2000). The *Pteridifolia* Group corresponds to our Groups 32, 34 and 35 where they are treated as subgroups. It is likely that the groupings in both schemes are polyphyletic and will need to be separated. A phylogenetic study of *Grevillea* remains an urgent priority.

The principal character states that define Group 35 are leaves dorsiventral, discolorous; torus straight or oblique; perianth zygomorphic, glabrous on the inner surface (ignoring hairs about the anthers in a few species); ovary densely hairy; style longer than the perianth and looped out before anthesis; fruits bearing hairs with reddish or brown contents in stripes or blotches.

The *Grevillea* species descriptions closely follow the format and terminology used by D.J. McGillivray (1993) though some modifications and changes have been incorporated. Methods of working, additional characters and clarifications of morphological terminology have been outlined in Olde & Marriott (1993a, 1993b, 1994a, 1994b, 1995).

Short key to the new species of *Grevillea*

- 1 Leaves dorsiventral with lower surface 1- or 2-grooved
- 2 Some or all leaves with secondary division **G. kirkalocka**
- 2* All leaves with primary division
- 3 Perianth limb glabrous or almost so; fruits 11–12 mm long; nectary obscure.. **G. kirkalocka**
- 3* Perianth limb densely hairy; fruits 15–19 mm long; nectary prominent **G. nana**
- 4 Perianth limb densely hairy; basal leaf lobes patent to spreading, widely divaricate and divergent from the rachis; leaves and leafy branches often entangled **G. nana**
- 4* Perianth limb either glabrous or almost so; basal leaf lobes ascending, not widely divergent laterally from the rachis; leaves and leafy branches not usually entangled **G. tenuiloba**
- 1* Leaves subterete-dipleural (i.e. with a longitudinal groove along each side)
- 5. Ovarian stipe 3.3–5 mm long; primary leaf lobes usually 3; fruits lacking glandular hairs **G. aneura**
- 5* Ovarian stipe < 1 mm long; primary leaf lobes usually 5; fruits with glandular hairs **G. squiresae**

Amendments to *Grevillea* key

The following is an amendment to the key to species of group 35, in "The *Grevillea* Book" Volume 1 (Olde & Marriott 1994b: 218–219). It is amended by substituting all leads between lead 35 and lead 35*.

- 35 Leaves subpinnatisect; leaf undersurface either not visible or enclosed by revolute margins
- 36 Leaf lobes subterete-dipleural (i.e with a [hair-filled] groove along each side)
- 37 Ovarian stipe 3.3–5 mm long; primary leaf lobes usually 3; fruits lacking glandular hairs **G. aneura**
- 37* Ovarian stipe < 1 mm long; primary leaf lobes usually 5; fruits with glandular hairs **G. squire**
- 36* Leaf lobes dorsiventral with one or two grooves clearly confined to the lower surface
- 38 All leaves with primary division only
- 39 Leaf lobes rigid, pungent; style gradually thickened over the apical few mm into the style end
- 40 Perianth limb glabrous (rarely with occasional scattered hairs); leaf lobes closely aligned and straight, often with a raised midvein on upper surface; leaves and leafy branches not usually entangled **G. tenuiloba**
- 40* Perianth limb densely hairy; leaf lobes patent to spreading, widely divaricate and divergent from the rachis; leaves and leafy branches often entangled..... **G. nana**

- 39* Leaf lobes non-rigid, non-pungent to scarcely pungent; style-end abruptly divergent from line of style
- 41 Pistil > 22 mm long; pollen-presenter usually > 1 mm wide; stylar indumentum extending > 2 mm beyond ovary **G. baxteri**
- 41* Pistil < 22 mm long; pollen-presenter < 1 mm wide; stylar indumentum extending < 2 mm beyond ovary **G. cagiana**
- 38* Some or all leaves with secondary division
- 42 Ovary villous with many ascending to spreading hairs, sometimes evident at the apex only; ultimate leaf lobes straight; floral bracts 0.8–5 mm long
- 42a Longest leaves > 10 cm long **G. nana**
- 42a* Longest leaves < 6.5 cm long
- 42b Pedicels 4–4.5 mm long; torus 2 mm wide, oblique at 40–60 degrees; pollen-presenter very oblique to lateral; some of all conflorescence repent **G. kirkalocka**
- 42b* Pedicels 2.5–3 mm long; torus < 2 mm wide, \pm straight; pollen-presenter oblique at c. 40 degrees; conflorescences not repent **G. treueriana**
- 42* Ovary silky with all hairs closely appressed; ultimate leaf lobes wavy; floral bracts 0.3–0.7 mm long **G. ilicifolia**
- 35* Leaves either simple and entire or toothed, or if deeply divided then the undersurface exposed

Grevillea kirkalocka P. Olde & N. Marriott, *sp. nov.*

Affinis *Grevilleae nanae* C.A. Gardner sed foliis bipartitis, perianthii limbo fere glabro, ovario adpresso-villoso, nectario obscuro, folliculis minoribus differt.

Typus: Kirkalocka Station, [exact location withheld for conservation reasons], Western Australia, 30 August 1995, S. Toole SLT 52 (*holo:* PERTH 04621883).

Related to *Grevillea nana* C.A. Gardner but differing in its twice-divided leaves, its almost glabrous perianth limb, appressed-villous ovary, obscure nectary, and smaller fruits.

A low spreading to decumbent *shrub* 0.4–0.6(1) m high, 1–1.5 m wide, with down-arching branches, with at least some floral branches on the ground; juvenile growth loosely villous with hairs both red and white; branchlets rounded, stout, openly tomentose with prominent, glabrous ribs decurrent from mid- and edge-vein leaf traces, the ribs extending down and terminating below adjacent leaf nodes. *Leaves* spreading to patent, crowded and somewhat entangled, subsessile, 4–6 cm long c. 6 cm wide, widely and divaricately 3–5 partite; primary lobes occasionally simple, mostly tripartite; basal lobes c. 1 cm from point of attachment; ultimate lobes narrow-linear, 1.2–2.2 cm long, 1.2 mm wide; apices pungent; leaf base linear; margins smoothly revolute; upper surface glabrous, smooth; lower surface bisulcate, curly hairs occasionally visible at the leaf sinuses and beside the midvein; venation obscure on the upper surface or the midvein faintly evident in the lamina, the midvein below prominent, rounded; texture rigidly coriaceous. *Conflorescence* erect, pedunculate, 3–5-branched, terminal or subterminal in the upper axils; unit conflorescences 6–8 cm long, conico-secund, dense but sometimes with scattered, widely spaced, uniflorescences at the proximal end; floral development acropetal; primary peduncles 8 mm long, tomentose, angularly ribbed; floral rachises slightly incurved, villous before anthesis, becoming sericeo-tomentose at and just after anthesis; conflorescence bracts 4–5.5 mm long, triangular with attenuate apex; floral bracts linear-subulate to ovate-acuminate, 1.8–5 mm long 0.2–2 mm wide, glabrous with ciliate margins, sometimes a few evanescent hairs outside, strongly concavitous at the

base, caducous. *Flowers* acroscopic, perianth and styles red; pedicels 4–4.2 mm long, sericeo-tomentose; torus 2 mm across, oblique at *c.* 45 degrees, cupuliform; nectary patelliform, lining the inner surface of the torus and extending 0.1 mm above the toral rim. *Perianth* zygomorphic, narrowly ovoid with slight basal dilation, gently recurved below the limb, 8–9 mm long, 2–2.2 mm wide, openly sericeous outside, glabrous inside, separating along the dorsal suture at the curve before anthesis and the style exerting and looping strongly first upwards and ultimately out to the ventral side; limb spheroidal, revolute, sericeous in bud, the hairs falling variably through development, ultimately glabrous at the apex and less dense overall on the limb than the perianth just before anthesis. *Pistil* *c.* 25 mm long; stipe *c.* 0.8 mm long, partly enclosed in the torus and adnate dorsally, rising *c.* 0.4 mm above the toral rim, sericeous; ovary 1.2 mm long, subtriangular, appressed white-villous; style glabrous from just above the ovary, dilating slightly from just below the style-end; style-end partially exposed dorsally before anthesis through partial separation of the suture; pollen-presenter 2 mm long, 1.25 mm wide, lateral to very oblique, round with cushion-like central boss and minute encircling flange; stigma central. *Fruits* 11–12 mm long, 9–10 mm wide, ovate to subhemispherical in side-view with apiculum 2.5–3 mm long, retrorse on the pedicels, the outside tomentose with glandular hairs interspersed, reddish stripes and blotches forming on young fruits, most hairs except a few glandular ones falling with age, the surface ultimately cracking and excoriating; inner surface slightly rugose; pericarp 0.6 mm thick throughout; texture crustaceous. *Seeds* not seen. (Figure 2)

Other specimens examined. WESTERN AUSTRALIA: Kirkalocka Station [exact locations withheld for conservation reasons], 3 Sep. 2001, *P. Olde, N. Marriott & K. Alcock* 01/76, 01/83, 01/84 (NSW, PERTH).

Distribution. Western Australia; known only from a few sites at or within 20 km of the type locality.

Habitat and ecology. Grows in yellow sand with some ironstone gravel in open, mixed sandheath dominated by mallee eucalypt, several *Acacia* spp., *Banksia rosserae* (at one site only), and *Triodia basedowii*. with *Grevillea acacioides*, *G. pterosperma* (at one site), *G. apiculoba* subsp. *apiculoba*, *G. biformis* subsp. *biformis*, *Calothamnus* sp., *Melaleuca* sp. aff. *filifolia*, *Styliidium repens*, *Baeckea* sp., *Hakea invaginata*.

Flowering period. Late winter to early spring.

Fruiting period. Probably late spring

Conservation status. Conservation Codes for Western Australian Flora: Priority One. Only known from a few sites on private land.

Etymology. Named *kirkalocka* after the station on which this species was found and as a mark of respect for the proprietors who have a progressive conservation ethic. The epithet is used as a noun in apposition and is indeclinable.

Typification. Although *G. kirkalocka* has been seen in the field, none of the plants were flowering and all fruits were without seed. Regrettably, there are no isotypes for distribution.

Affinities. Closely related species have a similar style-end which does not abruptly diverge from the style and expand as it does in most species but rather the style gradually and evenly dilates in the apical few millimetres into the style-end. *Grevillea kirkalocka* appears most closely related to *G. nana*

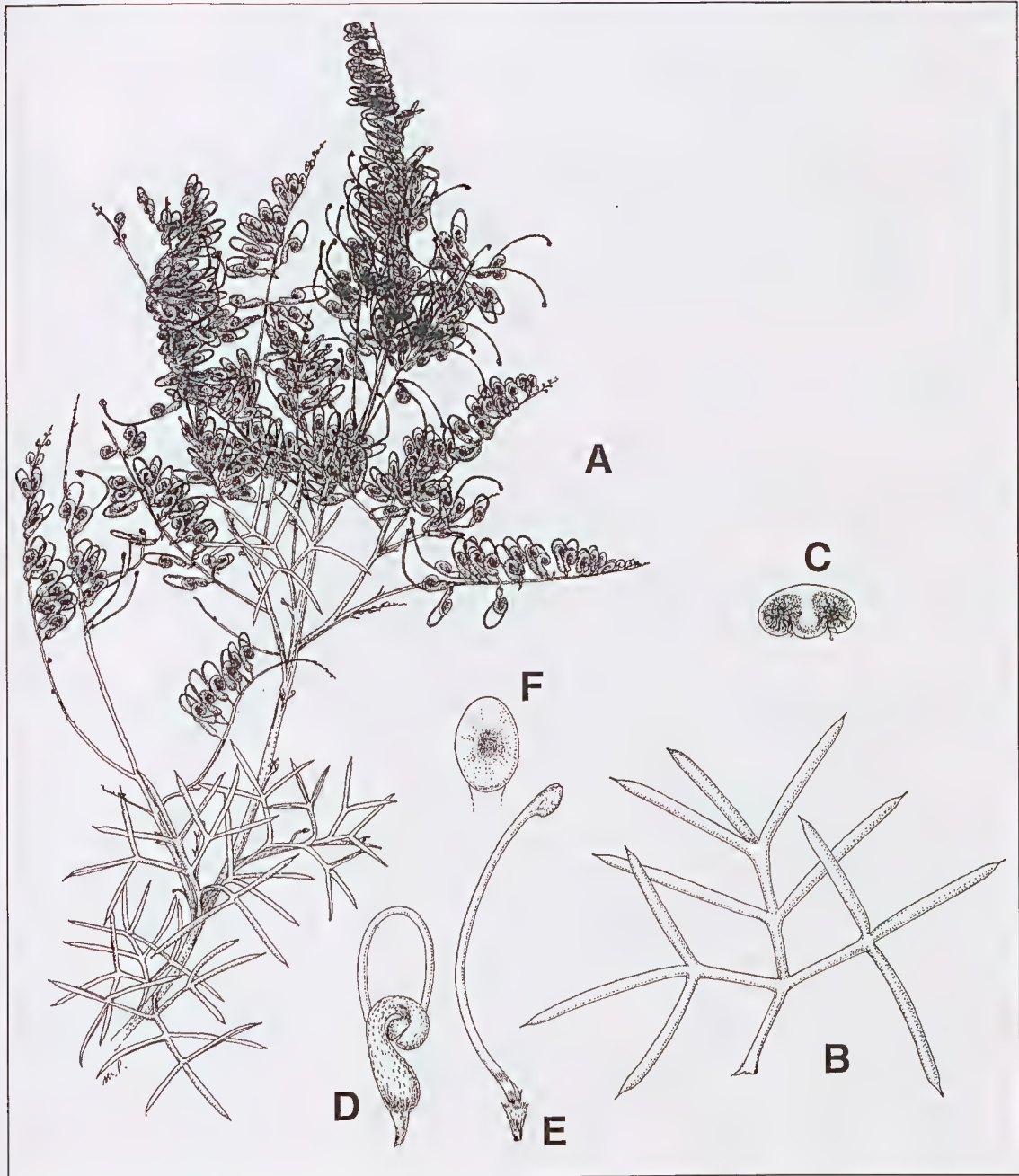


Figure 2. *Grevillea kirkalocka*. A – habit (x0.5), B – leaf (x1), C – cross-section of leaf (x6), D – perianth (x2), E – pistil (x2), F – style end (x6).

C.A. Gardner and *G. tenuiloba* C.A. Gardner and is perhaps more distantly related to *G. aneura* McGill and *G. squiresae*. *G. nana* differs in having leaves usually with primary division only, in its subsericeous-subvillous ovary, in its densely subsericeous to lanate outer perianth surface with the limb densely hairy and in its larger fruits (15–19 mm long). A recent collection of *G. nana* has some twice-divided leaves suggesting that this character may be less important than previously thought. Most collections of *G. nana* also have a prominent linguiform nectary, although some specimens with a less oblique torus tend also to have the nectary more obscure (McGillivray 1993: 368). Further collections

in late fruit are needed to determine whether *G. kirkalocka* has similar corky seeds to *G. nana*. Seed morphology of *G. nana* appears to be unique in Group 35, although not all species in the group have been examined (e.g. *G. squiresae*).

Grevillea tenuiloba differs from *G. kirkalocka* in also having only primary leaf division but also has ascending, closely aligned basal leaf lobes that diverge only a short distance laterally from the rachis and which often have a prominent midvein on the upper surface. It further differs in its smaller, less oblique pollen-presenter (at 15–25 degrees), its subsericeous-tomentose ovary with duller, shorter hairs, its glabrescent outer perianth surface, and in its glabrous perianth limb. *G. aneura* and *G. squiresae* have dipleuraleaves, and a sericeous perianth limb. It should be remembered that character states described are based on very limited material and may require modification.

Grevillea squiresae P. Olde & N. Marriott, *sp. nov.*

Affinis *Grevilleae aneurae* McGill. sed foliis longioribus, pinnatipartitibus plerum quinque primis lobis insertis, toro aut recto aut vix obliquo, nectario linguiformi, bracteis florum persistentibus, stipite ovarii brevissimo, fructibus glanduliferibus differt.

Typus: east of Mukinbudin [exact location withheld for conservation reasons], Western Australia, 28 September 1999, P. Olde & N. Marriott 99/28 (*holo*: NSW; *iso*: PERTH).

Related to *Grevillea aneura* McGill. but differing in its longer, pinnatipartite leaves with usually five primary lobes, its torus straight or slightly oblique, its linguiform nectary, persistent floral bracts, its ovary very shortly stipitate and in its glandular-haired fruits.

Single-stemmed *shrub* to c. 1 m high and 1 m wide; juvenile growth not seen; branchlets rounded, slender, silky becoming sparsely so with age, with glabrous ribs decurrent from leaf bases. *Leaves* ascending, not crowded, tangled when dry, sessile, 4.5–10.5 cm long, usually divaricately pinnatipartite, sometimes irregularly partite; primary lobes 3–5(7), occasionally simple, sometimes biternate, mostly some lobes secondarily tri- or occasionally bipartite, rarely with tertiary bi- or tri-sect division; basal lobes inserted 1–3 cm from point of attachment; ultimate lobes 1.4–4 cm long, 0.5–1.3 mm wide, subterete-dipleural, on broader lobes the lateral grooves visibly packed with appressed hairs, otherwise the grooves scarcely visible and tightly abutting; apices pungent; leaf base linear; margins smoothly revolute; upper and lower surfaces similar, glabrous or sometimes scattered appressed biramous hairs intermixed with minute, erect trichomes visible on the upper surface; venation not visible except the lower surface consisting of the midvein only; texture coriaceous. *Conflorescence* erect to decurved, sometimes on pendulous branches, shortly pedunculate, simple or 2-branched, terminal; unit conflorescences (3)4–8 cm long, conico-secund, somewhat lax; floral development acropetal; primary peduncles 2–5 mm long, sericeous, round; floral rachises straight to slightly sigmoid, sometimes ventrally concave, slender, sericeous to tomentose; conflorescence bracts ovate-apiculate, 1.8 mm long, 1.6 mm wide at base; floral bracts broadly ovate, 0.8 mm long, 1 mm wide, sericeous outside, glabrous inside, usually persistent to fruiting. *Flowers* acroscopic, perianth and styles red; pedicels 2–3.5 mm long, sericeous; torus 1.3–1.5 mm across, straight to slightly oblique, sometimes slightly concave in side-view; nectary broadly linguiform to patelliform usually with recurved margin, partially cupuliform and enclosed in the torus, extending 0.2 mm above the toral rim and extending 0.5 mm laterally beyond the torus. *Perianth* zygomorphic, ovoid-sigmoid, 8–10 mm long, 2–3 mm wide, sericeous outside, the hairs white or with reddish contents, glabrous inside, separating along the dorsal suture in the upper half before anthesis and the style looped strongly upwards; limb spheroidal, revolute, sericeous. *Pistil*

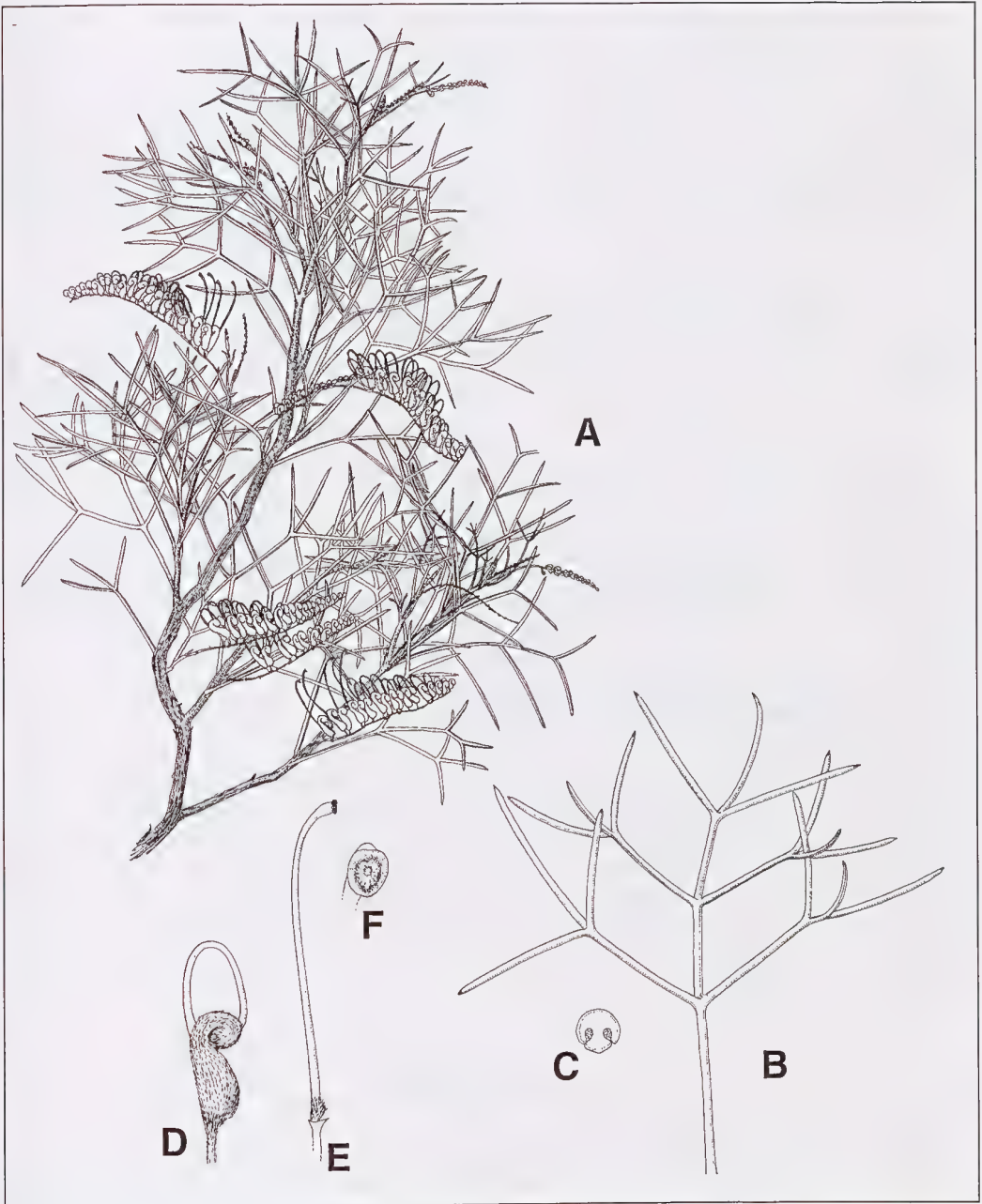


Figure 3. *Grevillea squiresae*. A – habit (x0.5), B – leaf (x1), C – cross-section of leaf (x6), D – perianth (x2), E – pistil (x2), F – style end (x6).

28–29 mm long; stipe 0.5–0.8 mm long, sericeous, about one third its length obscured within the torus; ovary 1 mm wide, 1 mm long, round, white-sericeous; style glabrous, except at base where usually hairs extend for *c.* 1 mm from top of ovary, apically recurved and gradually dilating *c.* 2 mm from the style-end; style-end partially exposed dorsally before anthesis through partial separation of the suture; pollen-presenter 1.8 mm long, 1 mm wide, oblique at *c.* 10–20 degrees, broadly elliptic, convex; stigma prominent, central. *Fruits* 15 mm long, 7–7.5 mm wide, ovoid, erect, white-sericeous with reddish stripes and patches extending over large areas of the surface and with numerous, late-developing glandular hairs intermixed; pericarp 0.2 mm thick; texture crustaceous. *Seeds* not seen. (Figure 3)

Distribution. Western Australia, near Mukinbudin.

Habitat and ecology. Grows in yellow sand in low heath with *Melaleuca*, *Dampiera* and *Baeckea* spp.

Flowering period. Spring.

Fruiting period. Probably late spring to early summer.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. *G. squiresae* is known from two populations, both near Mukinbudin. The type of population grows along a single roadside in a narrow but still undisturbed verge. Adjoining natural vegetation needs urgently to be surveyed as it may contain further remnant populations.

Etymology. Named in honour of Mary Alice Squires (nee McInnes) (1940–) of Mukinbudin, Western Australia who first discovered this species and drew attention to it.

Affinities. *Grevillea squiresae* is closely related to *G. aneura* and was initially mistaken for that species. *G. aneura* is distinguished by its tripartite leaves, usually with some secondary division of the primary lobes, its caducous floral bracts, its long-stipitate ovary (the stipe 3.3–5 mm long), its sub-annular to funnel-shaped nectary, its torus oblique at 20–30 degrees, its very oblique to almost lateral pollen-presenter, and in its sericeous fruits that have no glandular hairs. *G. aneura* generally has more spreading flowers on the confluences than *G. squiresae* which has strongly secund confluences. *G. aneura* is distributed from east of Lake King to Red Lake, well to the south-east of the known distribution of *G. squiresae*.

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We wish to thank Ann Pilkington who discovered *Banksia rosserae* and who drew it to our attention through various third parties. Ann and her husband Geoff Pilkington kindly gave permission to collect on their property. Special acknowledgement is given to Keith Alcock who located the *Banksia rosserae* population on our recent expedition after a long, difficult search. The Squires and Garlick families were particularly hospitable and generous in sharing knowledge and time. Our deepest appreciation is given also to Margaret Pieroni for the magnificent illustrations. The anonymous referee, through constructive suggestion and comment, has markedly improved the presentation and content of this paper. The authors also acknowledge with appreciation financial support provided towards their expeditionary expenses by the Grevillea Study Group of the Association of Societies for Growing Australian Plants. We appreciate greatly access to collections provided by the directors of herbaria at NSW and PERTH.

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